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CORNELL UNIVERSITY

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ITHACA, N. Y.

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CRSR 622

SEMI-ANNUAL STATUS REPORT

ON

NGR 33-010-137

OPTICAL AND DIELECTRIC OBSERVATIONS

OF LUNAR SAMPLES

for the period of

February 1, 1975 — July 31, 1975

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1. Albedo determination for different layers in core samples.

The request for one series of core samples (that from core 60007) was desired by the curator on June 18, 1975. The other series of core samples requested for albedo determination (that from core 15003) arrived in this laboratory on July 28, just 3 days before the end of this reporting period, thus we are unable to report any results on this project at this time.

2. Electrical properties of Apollo 17 dust and rock samples.

We measured the radar frequency (450 MHz) electrical properties of four Apollo 17 surface soil samples: 73241, 74220, 75061 and 76501. The dielectric constant and the power absorption length of these samples were determined. The interesting observation was that while the absorption length in some of these samples, like in those from the Apollo 15 and 16 sites, is extremely large (small loss tangent), the mare type soil, 75061, has electrical properties similar to those of the Apollo 11 and 12 soil samples (larger loss tangent, though still small compared with terrestrial rock powders). Earlier it was believed that samples from the first Apollo missions were stronger radio absorbers than samples from the last missions, due to water contamination introduced by sample handling (Gold et al, 1973 and Olhoeft et al, 1975). While

water contaminations can certainly strongly alter the results of electrical measurements, it seems now that there is a correlation between the power absorption and chemical properties of the samples. The mare basalt type material is very absorbent and the so called highland type material is much less absorbent. Furthermore, as the attached figure shows, the albedo and the power absorption length in soil samples show good correlation.

We have demonstrated that the albedo is a function of surface iron concentration in soil samples: (The soil grains are enriched in irons due to lunar weathering), the higher the surface iron concentration, the lower is the albedo (Gold et al, 1974 and 1975). The correlation of albedo and absorption length implies that the absorption length might also be a function of surface iron concentration, specifically, the reduced iron on the surface of mature, iron-rich soil samples might be responsible for the high loss tangent. We are awaiting the Apollo 17 rock samples to be analyzed. If the role of reduced iron is indeed important in influencing the elctrical properties of the soil, ground up Apollo 17 rock samples of similar chemistry as the 75061 type soil should be less absorbent. Our results will be prepared for publication as soon as the analysis of Apollo 17 rock samples is completed.

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Gold, T., Bilson, E. and Baron, R. L. (1974). Observation of iron rich coating on lunar grains and a relation to low albedo. Proc. Fifth Lunar Sci. Conf., 3, pp. 2413-2422, Pergamon.

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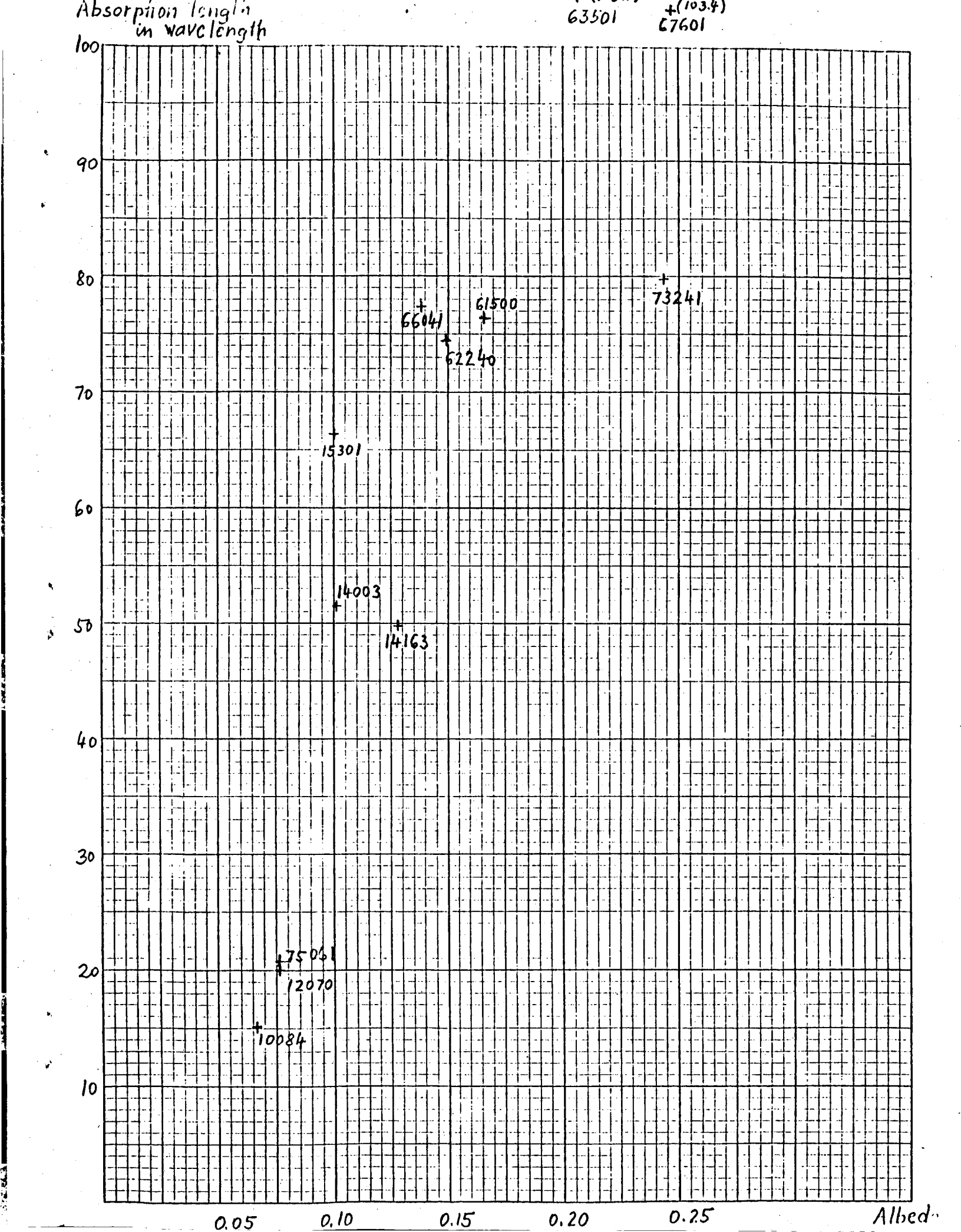
FIGURE CAPTION

Plot of albedo vs power absorption length for twelve soil samples suggesting that a relation exists such that the absorption of light and of radio waves is positively correlated.


Absorption length
in wavelength
100
90
80
70
60
50
40
30
20
10
63501
+(103.4)
67601
73241
61500
66041
62240
15301
14003
14163
75061
12070
10084
0.05
0.10
0.15
0.20
0.25
Albed